THE CLAIMS:

38. (Previously presented) A fuel cell comprising:

a housing including an anode chamber, a cathode chamber, a protonically conductive, substantially electronically non-conductive membrane electrolyte separating said chambers; and

a thermally sensitive actuator for controlling a flow of a fluid to/from the fuel cell.

38. (Previously presented) The fuel cell according to claim 37, wherein said flow comprises a flow fuel or a flow of water.

39. (Previously presented) The fuel cell according to claim 37, wherein the anode chamber is in fluid communication with a fuel source and wherein said flow comprises a flow of fuel or a fuel mixture to the anode chamber.

40. (Previously presented) The fuel cell according to claim 39, wherein said fuel source communicates with said anode chamber via a conduit.

41. (Previously presented) The fuel cell according to claim 40, wherein said thermally-sensitive actuator is proximate said conduit.

42. (Previously presented) The fuel cell according to claim 40, wherein a temperature of said conduit reflects an operational temperature of said fuel cell.

43. (Previously presented) The fuel cell according to claim 37, wherein said thermally-sensitive actuator comprises a bi-metal material and/or a shape-memory alloy.

44. (Previously presented) The fuel cell according to claim 43, wherein said shape memory alloy comprises nickel and/or titanium.

45. (Previously presented) The fuel cell according to claim 40, wherein said conduit

includes a deformable material.

46. (Previously presented) The fuel cell according to claim 39, wherein said fuel source is selected from the group consisting of: a fuel cartridge, a pump, and a mixing chamber.

47. (Previously presented) The fuel cell according to claim 45, wherein said actuator is positioned adjacent said deformable material.

48. (Cancel) A method for controlling flow in a fuel cell, comprising:

producing electrical energy in the fuel cell; and

actuating a thermally-sensitive actuator based on a temperature of the fuel cell for controlling a flow.

49. (Cancel) The method according to claim 48, wherein said thermally-sensitive actuator increases or decreases said flow.

50. (Cancel) The method according to claim 48, wherein said flow comprises a flow of fuel to the fuel cell or a flow of water to the fuel cell.

51. (Cancel) The method according to claim 48, wherein said actuator comprises a shape memory material, alloy and/or a bimetal material.

52. (Cancel) The method according to claim 51, wherein said bimetal material comprises a nickel and/or titanium alloy.

53. (Cancel) The method according to claim 48, wherein said thermally-sensitive actuator is actuated in response to heat generated by the fuel cell.

54. (Previously presented) A fuel cell comprising:

a housing including an anode chamber having a fuel mixture, said

anode chamber in communication with a flow for adjusting the concentration of said fuel mixture, a cathode chamber, a protonically conductive, substantially electronically non-conductive membrane electrolyte separating said chambers; and

a fuel concentration-actuated valve for controlling said fluid flow.

55. (Previously presented) The fuel cell according to claim 54, wherein said flow comprises a fuel flow or a water flow.

56. (Previously presented) The fuel cell system according to claim 54, wherein said fuel mixture includes methanol.

57. (Previously presented) The fuel cell according to claim 54, wherein said fuel concentration-actuated valve comprises a first material which expands in direct relation to fuel concentration.

58. (Currently amended) The fuel cell according to claim 57, wherein said first material comprises a perfluorosulfonic acid polymer ~~Nafion~~.

59. (Cancel) The fuel cell according to claim 57, wherein said first material is positioned proximate a flow channel providing said fluid flow.

60. (Cancel) A method for controlling a flow in a fuel cell, comprising

producing electrical energy in said fuel cell;

providing a flow of a fluid to a fuel mixture of said fuel cell in response to said production of electrical energy; and

expanding a first material in response to a fuel concentration of said fuel mixture, wherein expansion of said first material controls said flow.

61. (Cancel) The method according to claim 60, wherein said flow comprises a flow of

water or a flow of fuel.

62. (Cancel) The method according to claim 60, wherein said first material comprises Nafion.

63. (Cancel) The method according to claim 60, wherein said expansion of said first material increases or decreases said flow.

64. (Previously presented) A sensor for determining a concentration of fuel in a fuel mixture for a fuel cell comprising a conductor disposed on or within a first material, wherein said first material expands in proportion to the concentration of fuel based on exposure to a fluid.

65. (Previously presented) A sensor for determining the presence of a fuel in a fuel cell comprising a conductor disposed on or within a first material, wherein said first material expands in proportion to the concentration of fuel based on exposure to a fluid.

66. (Previously presented) The sensor according to claims 64 or 65, wherein said fluid is water, methanol or a methanol/water mixture.

67. (Cancel) A method for determining a concentration of fuel in a fuel cell comprising:

providing a dimensionally variable first material capable of expansion and contraction in relation to a concentration of fuel in a fuel cell, wherein a conductor is disposed on or within the first material;

flowing an electrical current through said conductor;

measuring an electrical property of said conductor, wherein as fuel concentration changes, the first material expands resulting in a proportionate change to the electrical property of said conductor.

68. (Cancel) The method according to claim 67, wherein the electrical property comprises at least one of resistance, impedance, and conductance.

69. (Previously presented) A direct methanol fuel cell system comprising:

an anode chamber having an anode and a diffusion layer, wherein a fuel is introduced to the anode chamber via the diffusion layer;

a fuel source in fluid communication with said anode chamber;

a cathode chamber having a cathode and a diffusion layer, wherein said diffusion layer is in fluid communication with an oxidizer; and

a protonically conductive, substantially, electronically non-conductive membrane electrolyte separating said chambers and positioned substantially adjacent to said diffusion layers; and

a first valve for controlling a flow of a fluid in response to an operating parameter of the fuel cell system.;

70. (Previously presented) The system according to claim 69, where said valve comprises a thermally-sensitive actuator.

71. (Previously presented) The system according to claim 70, wherein said thermally-sensitive actuator comprises a shape memory material or alloy.

72. (Previously presented) The system according to claim 69, wherein said operating parameter comprises temperature and/or fuel concentration.

73. (Previously presented) The system according to claim 69, wherein said valve comprises a first material capable of expansion proportional to a change in fuel concentration.

74. (Currently amended) The system according to claim 73, wherein the first material

comprises a perfluorosulfonic acid polymer ~~Nafion~~.

75. (Previously presented) A switch for a fuel cell, said fuel cell comprising a housing including an anode chamber, a cathode chamber, a protonically conductive, substantially electronically non-conductive, membrane electrolyte separating said chambers, said switch comprising:

a thermally-sensitive material wherein below a predetermined temperature, said switch is in a first position, and upon said fuel cell reaching said predetermined temperature said switch is switched to a second position.

76. (Previously presented) The switch according to claim 75, wherein said thermally sensitive material comprises a shape memory alloy.

77. (Previously presented) The switch according to claim 76, wherein said thermally-actuated shape memory alloy comprises nickel and/or titanium.

78. (Previously presented) The switch according to claim 75, wherein said switch is disposed proximate to a portion of said fuel cell which reflects a current operational temperature of said fuel cell.

79. (Previously presented) The switch according to claim 75, wherein a positioning of said switch between said first position and said second position is variable depending upon an operating temperature of said fuel cell.

80. (Previously presented) A switch for a fuel cell, said fuel cell comprising a housing including an anode chamber, a cathode chamber, a protonically conductive, substantially electronically non-conductive, membrane electrolyte separating said chambers, said switch comprising:

a first material having expansion properties upon exposure to a fluid,

wherein said switch is in a first position prior to exposure to said fluid and said switch is in a second position after said first material is exposed to said fluid.

81. (Previously presented) The switch according to claim 80, wherein a positioning of said switch between said first position and said second position is variable in a non-linear aspect in relation to an amount of said fluid said first material is exposed to.

82. (Previously presented) The switch according to claim 80, wherein said switch is placed in a third position upon exposure of said first material to a concentration of a second fluid.

83. (Previously presented) The switch according to claim 80, wherein the fluid comprises water or methanol.

84. (Previously presented) The switch according to claim 80, wherein an actual position of said third position is directly dependent upon said concentration of methanol.

85. (Previously presented) A thermally sensitive actuator for controlling a flow of a fluid to/from the fuel cell comprising a bi-metal material and/or a shape-memory alloy.

86. (Previously presented) The actuator according to claim 85, wherein said shape memory alloy comprises nickel and/or titanium.

87. (Previously presented) A fuel concentration-actuated valve for controlling a fluid flow in a fuel cell comprising a first material which expands in direct relation to fuel concentration.

88. (Currently amended) The fuel concentration-actuated value according to claim 87, wherein the first material comprises a perfluorosulfonic acid polymer ~~Nafion~~.